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(12) (19) (CA) **Demande-Application**

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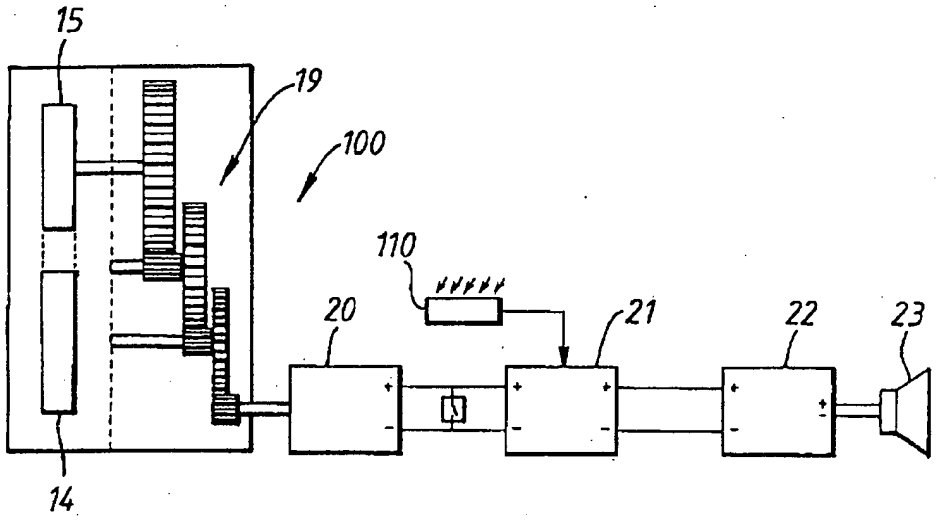
(54) **GENERATEUR**
(54) **GENERATOR**



(57) The invention concerns a generator for generating electric power and comprises a source of stored energy, a gear train connected to the energy source so as to be driven thereby and to drive a generator for supplying current to a load, a solar panel, a capacitor connected to the output of the panel, and a control circuit including a transistor switch arrangement and arranged so that excess charge generated by the generator can also be supplied to the capacitor, and the capacitor can take over the supply of energy to a load.

ABSTRACT

The invention concerns a generator for generating electric power and comprises a source of stored energy, a gear train connected to the energy source so as to be driven thereby and to drive a generator for supplying current to a load, a solar panel, a capacitor connected to the output of the panel, and a control circuit including a transistor switch arrangement and arranged so that excess charge generated by the generator can also be supplied to the capacitor, and the capacitor can take over the supply of energy to a load.

CLAIMS:

1. A generator device for providing a controlled output current to a load, the device comprising:

a) a panel for generating electric current from light;

b) a capacitor connected to the output of said panel;

c) a source of stored energy;

d) a gear train connected to the source of stored energy so as to be driven thereby;

e) output terminals for connection to a load;

f) a generator for supplying electric current to said output terminals and to said capacitor; and

g) a control circuit for controlling supply of electrical current to said output terminals from both said capacitor and said generator, the control circuit comprising:

h) a transistor switch arrangement for enabling current from said generator in excess of said load to charge said capacitor in addition to the output of said panel and for shorting the connection between the generator and said output terminals if the charge across said capacitor exceeds a predetermined value whereby the charge stored in said capacitor is supplied to said load.

2. A generator device according to claim 1, and wherein

the transistor switch arrangement comprises three transistors, a first transistor connected across the capacitor and triggered when the charge across the capacitor exceeds said predetermined value, a second transistor the base of which is connected to an electrode of said first transistor and an electrode of which is connected to the base of the third transistor, the electrodes of which are connected across the outputs of the generator so that when said second transistor is switched on by said first transistor, said third transistor short circuits the output of said generator.

3. A generator device according to claim 2, wherein said third transistor is a FET transistor.

4. A generator device according to claim 1, and including a Schottky diode to prevent current flowing from said capacitor to said generator.

5. A generator device according to claim 1, and further comprising a first switch for connecting the output of the generator to the load, and a socket switch for connecting the generator device to an external power source, operation of the socket switch to connect an external power source of the load causing disconnection of said first switch.

GENERATOR

The present invention concerns apparatus for generating electric current. It is particularly concerned with providing a compact and reliable generator which is readily portable. Such a generator can find many fields of application one of which would be for use in providing power for portable radios in environments where there is no provision of electrical mains.

It is, of course, well-known to provide generators driven by pedal power. These, of course, require continuous effort in order to be operational. A radio having a removable spring-powered generator has been disclosed in UK Patent Specification No. 2262324 filed by the inventor of the present application. However, it proved exceptionally difficult to put into practice the basic concept described in the above UK patent specification. Many of the problems associated with mechanically powered generators have been overcome using the arrangements disclosed in US Patent Application, Serial No 08/704404 from which the present application is a continuation-in-part and the contents of which are herein incorporated in the present specification by reference.

The present invention is concerned with an improved

version of the power supply disclosed and claimed in the above mentioned US patent specification.

In particular it is concerned with increasing the time for which the stored energy can be usefully used.

In accordance with the present invention there is provided a generator device for providing a controlled output current to a load, the device comprising:

a) a panel for generating electric current from light;

b) a capacitor connected to the output of said panel;

c) a source of stored energy;

d) a gear train connected to the source of stored energy so as to be driven thereby;

e) output terminals for connection to a load;

f) a generator for supplying electric current to said output terminals and to said capacitor; and

g) a control circuit for controlling supply of electrical current to said output terminals from both said capacitor and said generator, the control circuit comprising:

h) a transistor switch arrangement for enabling current from said generator in excess of said load to charge said capacitor in addition to the output of said panel and for shorting the connection between the

generator and said output terminals if the charge across said capacitor exceeds a predetermined value whereby the charge stored in said capacitor is supplied to said load.

In order that the present invention may be more readily understood, embodiments thereof will now be described by way of example and with reference to the accompanying drawings in which:

Figures 1 and 2 are perspective views of a radio incorporating the present invention;

Figure 3 and 4 are side and plan views of a removable power generating cassette which can be mounted in the radio of Figure 1;

Figure 5 is a view of a spring in the cassette of Figures 3 and 4;

Figure 6 is a section through a gearbox associated with the cassette of Figures 3 and 4; and

Figure 7 is a block diagram illustrating the arrangement of the main components of the radio of Figure 1; and

Figure 8 is a diagram of a control circuit.

Referring now to Figure 1 of the accompanying drawings, this figure shows a portable radio generally indicated at 1, and having a carrying handle 2 and a folding aerial 3. A loudspeaker grill is shown at 4 along with a station indicating panel 5. Tuning is controlled by a control knob 6 and volume by a control knob 7. The radio as viewed from Figure 2 is formed with a rotatably mounted disc 10 having a handle 11 pivotally mounted at 12 to the rim of the disc so that the handle can be stowed when not in use as shown in Figure 2 and when in use swung outwardly so as to project at right angles from the plane of the disc. This arrangement enables a user of the radio to wind up a power source mounted within the radio in the form of a spring. This spring is contained in a removable cassette shown in Figures 3 and 4 of the accompanying drawings and is shown in greater detail in Figure 5. The outer casing of the radio is made from a tough moulded thermoplastics material and is formed in two halves. These halves are held by screws inserted via openings. The casing can thus be opened in a simple manner to enable the cassette to be exchanged.

As can be seen from Figure 2 the radio also has a solar panel 110 which can also provide power to be used in the operation of the radio.

Referring now to Figures 3 and 4 , these show a plan and a side view of a cassette 100 which acts as a power source for the radio shown in Figures 1 and 2. This cassette comprises a coil spring 18 mounted on a stage drum 14 and a torque drum 15 and which provides the motive power for a generator. The spring management is fully described in the aforesaid patent specification. Accordingly no further detailed description will be given.

Associated with this spring in the cassette for the radio is a gear train generally indicated in Figure 6 at 19 for driving a DC generator. This gear box is also described in detail in US Patent Specification Serial No 08/704404 and will not be described in detail in the present specification.

Specifically referring now to Figure 7 this figure shows in diagrammatic form the solar panel 110; a power source including the storage drum 14, a torque drum 15 and a spring 18 which are internal components of cassette 100; the gear train 19 which is part of the gear box of Figure 3, a DC generator 20 which in operation is driven by the energy released from the spring through the gear train 19, a power control circuit 21, a radio circuit 22, and a loudspeaker 23. In this embodiment the DC generator 20 is a standard tape cassette brushed DC motor

made by Mabuchi and turned in reverse to generate electricity.

Figure 8 shows the power control circuit 21 in greater detail.

The operation of this circuit is as follows. Torque from the spring 18 mounted in cassette 100 rotates the generator armature through the gear train 19 to create current. Generated current flows through Schottky diode 101 to the radio 22 and to storage capacitor 102. Initially generated current flows into capacitor 102 causing the voltage across it to rise.

When the voltage across capacitor 102 reaches a predetermined value which is set by potentiometer 103 transistor 104 switches transistor 105 which in turn switches FET transistor 106. This shorts the generator terminals and virtually halts the motor and spring system. This is because the very high gearing of the generator means that a minimal increase in load across the output terminals of the generator will effectively brake the system. Transistor 105 has a positive feedback connection via resistor 107 keeping transistor 104 switched on.

During the phase where the spring system is

stationary, current flows (back) from capacitor 102 and continues to power the wireless 22. Diode 101 prevents any reverse current flow to generator. As capacitor 102 continues to power the radio, the voltage across it diminishes until the voltage across transistor 104 becomes insufficient for transistor 105 to keep transistor 104 switched on. As this low voltage threshold, which is the minimum voltage required by radio circuit 22, is reached, the three transistors 104,105,106 are switched "off". The generator 20 is no longer shorted and the spring system causes armature speed-up and current once again flows from the generator to capacitor 102 and the radio 22.

If again the current from generator 20 exceeds the radio demand, then the voltage across capacitor 102 will rise again to the predetermined value and the cycle just described is repeated.

The solar panel 110 is connected in parallel to capacitor 102 and any current generated by this panel contributes to the generator stream. This improves the flow to capacitor 102 and increases the likelihood of capacitor 102 reaching the value where the generator is shorted and the spring energy saved (as described above).

Should solar energy alone be sufficient to supply

the radio demand, the voltage across the solar panel 110 is sufficient to keep transistor 104 switched, which in turn continuously maintains a shorted generator condition with consequent preservation of spring energy.

The solar panel therefore also acts as a trigger. Should solar energy be sufficient to power the radio circuit 22, it will trigger transistor 104 and cause transistor 106 to switch, shorting the generator 20 and preserving spring energy. The radio circuit will then be powered exclusively by the solar panel whilst the spring engine is shut down.

Should solar energy be available but insufficient to sustain radio demand alone, it will still contribute to the generator current to capacitor 102. This decreases the spring "on" period and increases the spring "off" (stationary) period. This provides for a longer spring unwind time than without the arrangement which has just been described.

The circuit shown in Figure 8 is also provided with a pair of ganged switches 108, 109. Switch 109 is a single pole socket switch which responds to the insertion of a plug (not shown) to open switch 108 so as to isolate the output of the generator 20 from the radio circuit 22 and to enable the radio circuit 22 to be powered solely

by current from socket switch 109. Power from socket switch 109 travels directly from the socket switch via switch 108 to the radio circuit 22.

It will thus be appreciated that the primary purpose of the control circuit is to ensure that the radio, in the embodiment being described, or any other load that requires an electric current for operation, both receives the correct amount of power and that the energy stored in the spring cassette is not wasted.

It will be appreciated that the foregoing description has been directed to a portable radio with a removable spring powered generator cassette. It is, of course, entirely possible for the generator to be used for a wide range of other applications. Such applications could, of course, include charging batteries, providing power for other electronic equipment such as computers or calculators or even providing power for games equipment. It is, of course, not necessary for the actual mechanical source of power to be a spring of the nature described with regard to the preceding embodiments. The spring could be of an alternative material as there are now some extremely strong elastomeric materials which could be used to provide the motive power. It is additionally possible for the motive power to be provided by a compressed gas source expelling

the gas through a suitable converter which converts the energy of the escaping gas into rotational energy for driving a generator. If the gas were air then a suitable pump would be provided in order to compress the gas for subsequent use.

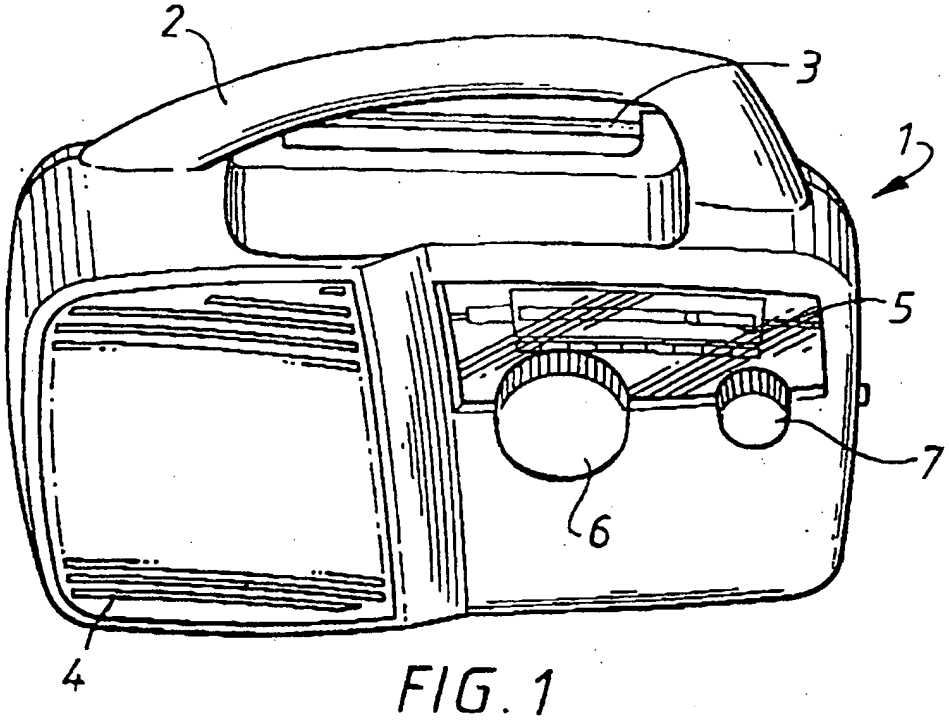


FIG. 1

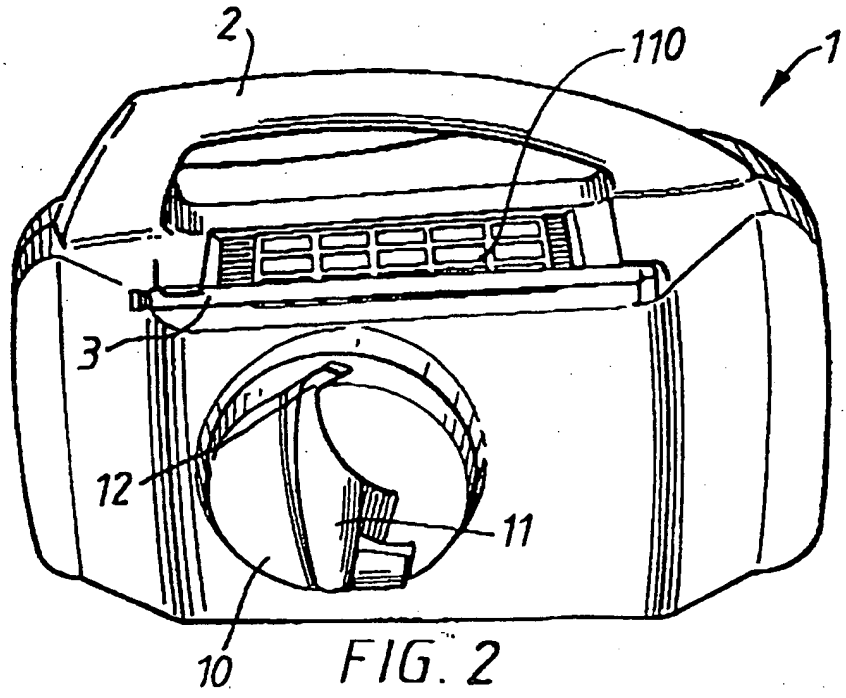


FIG. 2

FIG. 3

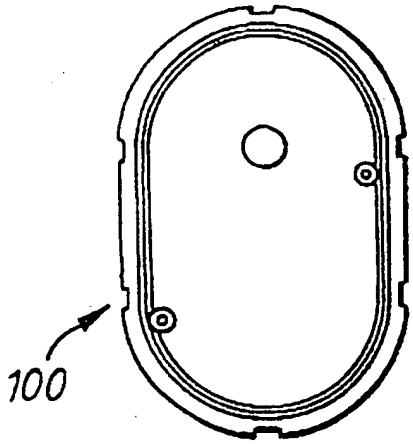


FIG. 4

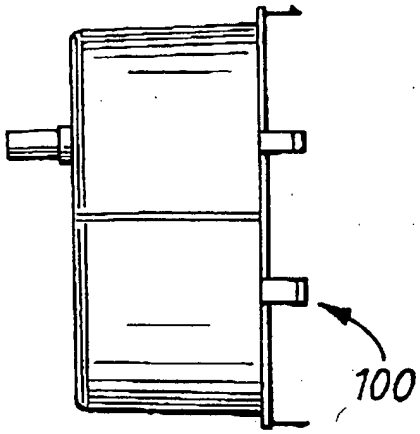


FIG. 5

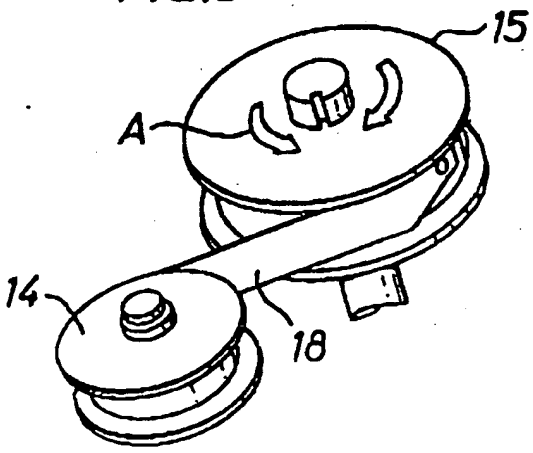


FIG. 6

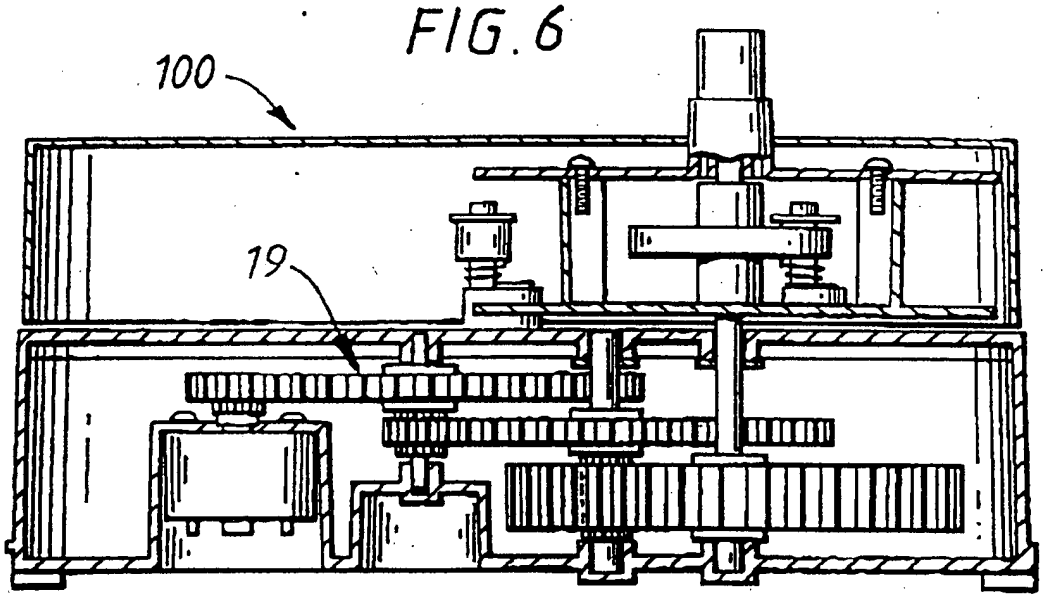
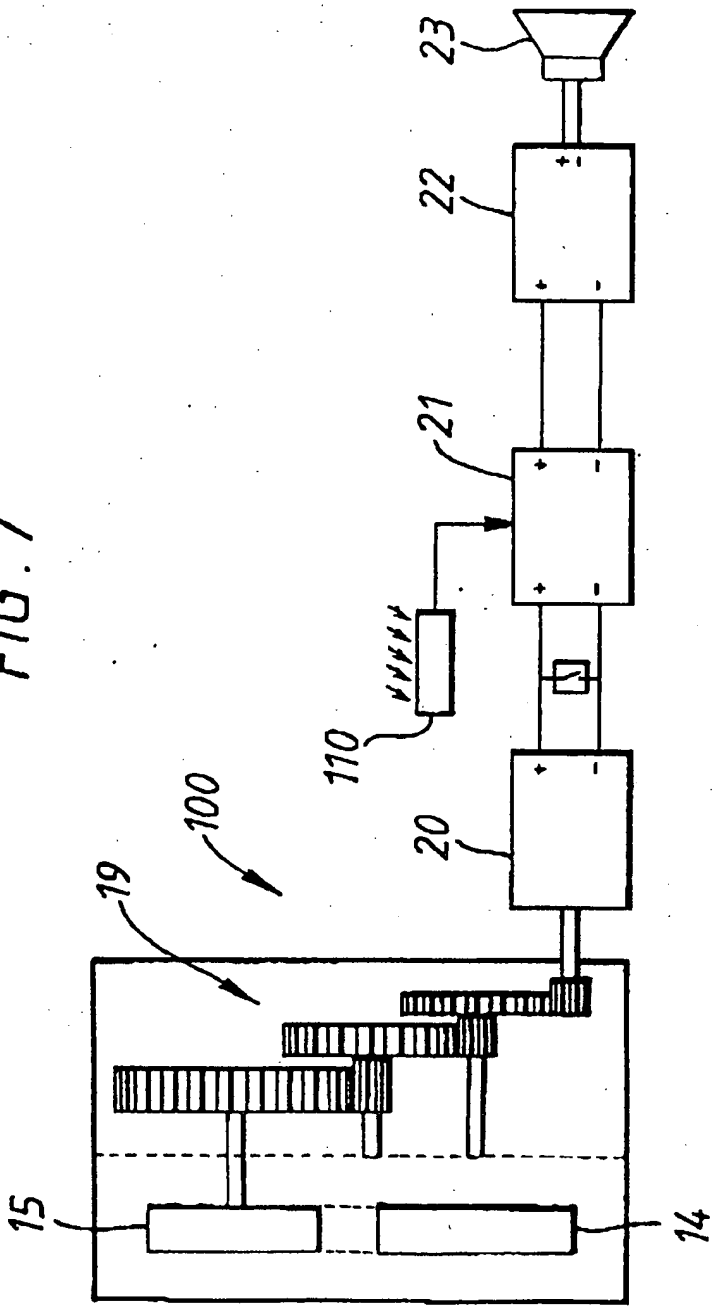


FIG. 7



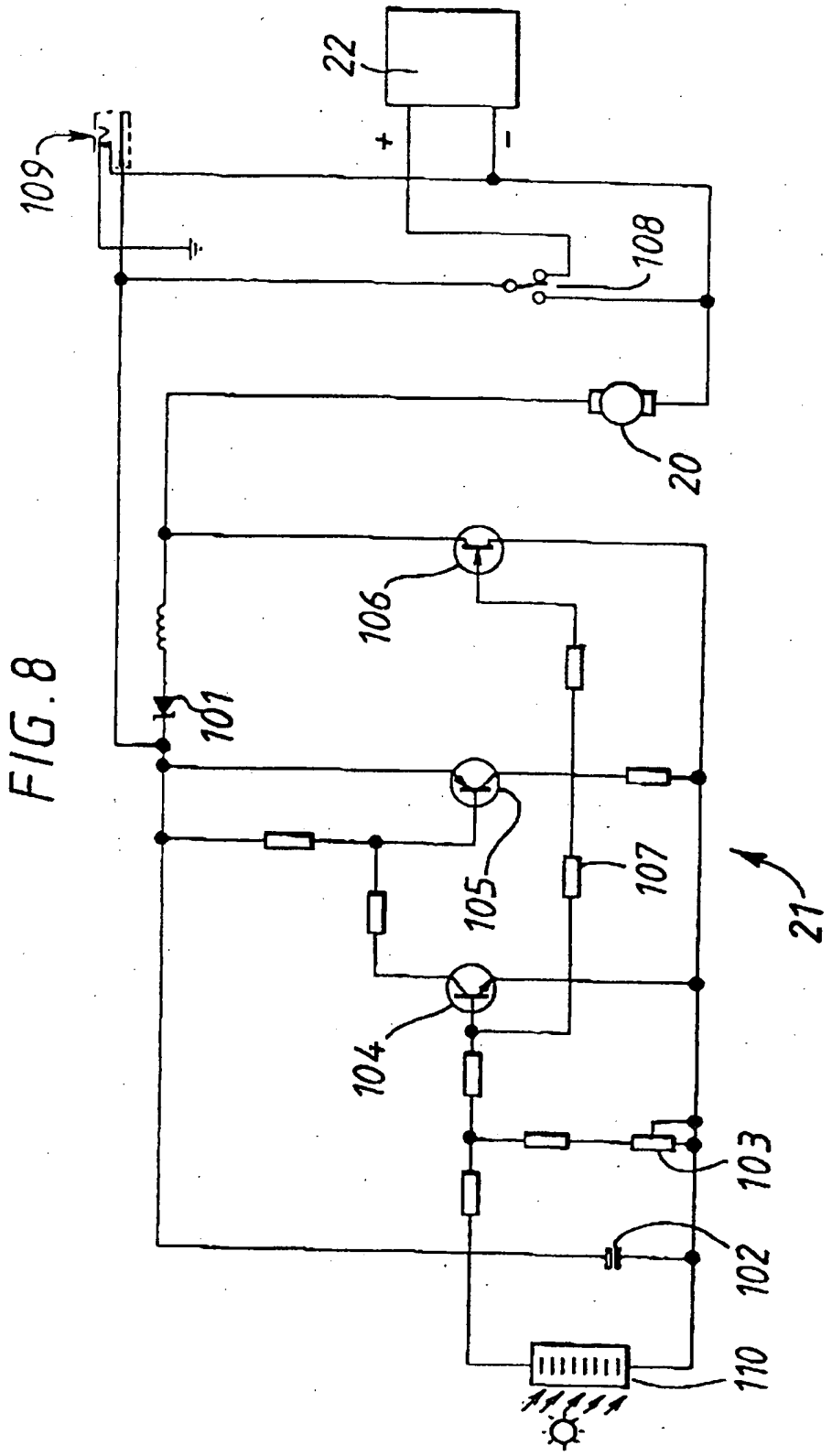
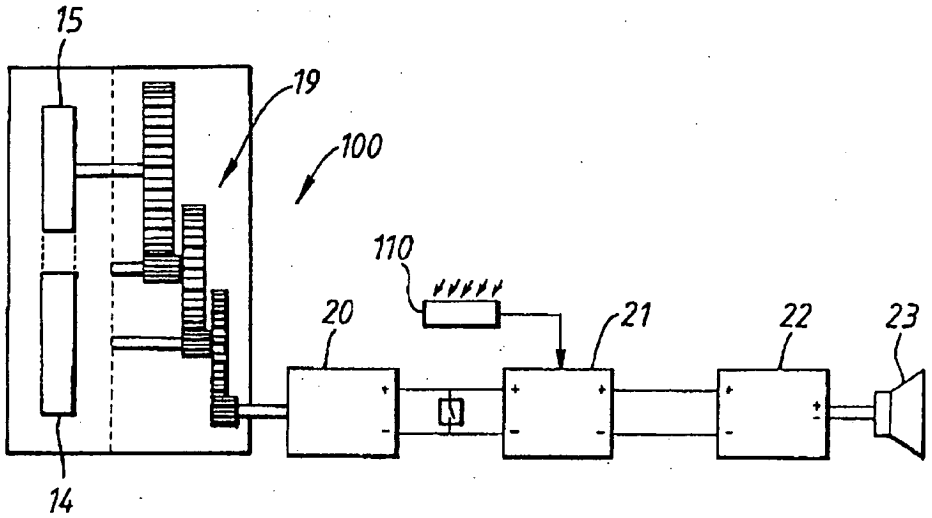


FIG. 8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